

I Claim:

1 1. A power controller for powering an induction electrical machine, comprising:
2 -- a first AC conductor and a second AC conductor for connecting to an AC line
3 power source;
4 -- a first controlled switch circuit which includes a first controlled switch element
5 having a first power terminal connected to said first AC conductor, a second
6 terminal, and a control input, and a diode connected in shunt across the
7 power terminals thereof;
8 -- a second controlled switch circuit which includes a second controlled switch
9 element having a first power terminal connected to said second AC
10 conductor, a second terminal, and a control input, and a diode connected in
11 shunt across the power terminals thereof;
12 -- a power capacitor having terminals connected to the second power terminals of
13 said first and second controlled switch elements, respectively;
14 -- load terminals coupled to the terminals of said power capacitor; and
15 -- a control circuit having at least one output coupled to the control inputs of said
16 first and second controlled switch elements, and at least one sensor input
17 connected to at least one of said load terminals.

1 2. The power controller according to Claim 1 wherein said first and second
2 controlled switching elements each include a switching transistor.

1 3. The power controller according to Claim 2 wherein said switching transistor is a
2 MOSFET bipolar transistor.

1 4. The power controller according to Claim 2 wherein said switching transistor is
2 an IGBT.

1 5. The power controller according to Claim 2 wherein said switching elements
2 include at least one semiconductor transistor across an associated one of said
3 diodes.

1 6. The motor speed controller according to Claim 1, also comprising optical means
2 coupling said control circuit with the control inputs of said first and second
3 controlled switch elements.

1 7. The motor speed controller according to Claim 1, comprising non-optical, non-
2 DC coupling means coupling said control circuit with the control inputs of said
3 first and second controlled switch elements.

1 8. A motor speed controller for powering an AC induction motor, comprising:
2 -- a first AC conductor and a second AC conductor for connecting to a source of
3 AC line power;
4 -- a first controlled switch circuit which includes a first controlled switch element
5 having a first power terminal connected to said first AC conductor, a second
6 power terminal, and a control input, and a first diode connected in shunt
7 across said power terminals thereof;
8 -- a second controlled switch circuit which includes a second controlled switch

9 element having a first power terminal connected to said second AC
10 conductor, a second power terminal, and a control input, and a second diode
11 connected in shunt across said power terminals thereof;

12 -- a first power capacitor having a first terminal and a second terminal, with a third
13 controlled switch disposed between the first terminal of said first power
14 capacitor and the second power terminal of the first controlled switch
15 element, said third controlled switch circuit including a third controlled
16 switch element and a third diode connected in shunt across said third
17 controlled switch element;

18 -- a second power capacitor having a first terminal and a second terminal, with a
19 fourth controlled switch circuit disposed between the first terminal of said
20 second power capacitor and the second power terminal of the second
21 controlled switch element, said fourth controlled switch circuit including a
22 fourth controlled switch element and a fourth diode connected in shunt
23 across said fourth controlled switch element, said third and fourth controlled
24 switch elements each having a respective control input;

25 -- output terminals coupled to the second power terminals of said first and second
26 controlled switch elements; and

27 -- a control circuit having at least one output coupled to the control inputs of said
28 first, second, third, and fourth controlled switch elements, and at least one
29 sensor input connected to at least one of said load terminals.

1 9. A power controller according to Claim 8, wherein said the second terminals of
2 said first and second power capacitors are coupled to said second AC conductor

3 and said first AC conductor, respectively.

1 10. A power controller according to Claim 8, wherein said the second terminals of
2 said first and second power capacitors are coupled to the second power terminals
3 of said second controlled switch element and of said first controlled switch
4 element, respectively.

1 11. A power controller according to Claim 8, wherein optical means couple the
2 control circuit to the first, second, third and fourth controlled switch elements.

1 12. A power controller according to Claim 8, wherein non-optical, non-DC
2 coupling means couple the control circuit to the first, second, third and fourth
3 controlled switch elements.

1 13. Power controller for powering an induction motor or similar load, comprising
2 input means adapted to connect with a source of AC line power, said line
3 power having a waveform and a line frequency;

4 output means adapted to connect to an AC load;

5 variable drive circuit means receiving line power from said input means and
6 delivering AC power via said output means to said AC load; said variable drive
7 means including means for storing and switching at least a portion of said line
8 power and selectively passing said line power to said output means in a plurality of
9 modes, including (a) said input AC line power being applied directly to said load;
10 (b) said input AC line power being applied to said load with current added at

11 portions of said waveform to reshape the AC waveform at said line frequency; and
12 (c) a reshaped sinusoidal or non-sinusoidal waveform being applied to said load at
13 a frequency that is different from said line frequency; and said variable drive
14 circuit means including a control circuit having sensor inputs coupled to said
15 output means for monitoring and controlling the waveform and frequency of the
16 power applied to said load.

1 14. Power controller according to Claim 13, wherein said variable drive circuit
2 means includes first and second optically driven switch circuits each coupled
3 between a respective AC input conductor and a respective output conductor of said
4 output means, and a pair of diodes connected across current-carrying conductors of
5 said first and second optically driven switch circuits, respectively.

1 15. Power controller according to Claim 14 wherein variable drive circuit means
2 includes a capacitor and an optically controlled switch in series therewith and
3 coupled to one of said output conductors.

1 16. Power controller according to Claim 14 wherein said control circuit includes
2 optical switching means optically coupled to said optically driven switches.

1 17. Power controller for powering an induction motor or similar load, comprising
2 - a first AC conductor and a second AC conductor for connecting to an AC line
3 power source;
4 - a controlled switched bridge, including a bridge element having at least first and

5 second AC inputs, and DC terminals; and a switch element connected across the
6 DC terminals of the switched bridge element.

7 - a control circuit for providing gating signals for selectively gating the switch
8 element of the controlled switched bridge; and

9 - means in series with said AC conductors for coupling across an armature of said
10 AC induction motor.

1 18. The power controller of Claim 17, further comprising sensor means coupled to
2 an input of said control circuit for providing motor speed input signal to said
3 control circuit based on a sensed condition of said AC load.

1 19. The power controller of Claim 17, wherein said bridge element includes a
2 diode bridge, and said switch element includes a MOSFET having a drain and a
3 source respectively connected to said DC terminals.